CLAIMS

What is claimed is:

1. A system for conveying a specimen-bearing grid from a first location to a second location, the system comprising:

a robotic arm;

an end effector attached to an end of the robotic arm and comprising a gripper apparatus adapted to grip the grid; and

a control means operably connected to the robotic arm and to the gripper apparatus and configured to control the robotic arm and the gripper apparatus such that the gripper apparatus grips the grid at the first location and the robotic arm conveys the gripped grid from the first location to the second location.

2. The system as recited in claim 1, wherein the gripper apparatus comprises a pair of opposed fingers coupled to at least one actuator.

3. The system as recited in claim 2, wherein the grid is substantially disk shaped and comprises an outer edge surface, and wherein each of the opposed fingers comprises a "V"-shaped notch adapted to engage the outer edge surface of the grid.

4. A system for inserting a specimen-containing holder into a microscope, comprising:

a robotic arm;

an end effector attached to an end of the robotic arm and comprising a gripper apparatus adapted to grip the holder; and

a control means operably connected to the robotic arm and to the gripper apparatus and configured to control the robotic arm and the gripper apparatus such that the gripper apparatus grips the holder, and the robotic arm inserts the gripped holder into the microscope.

5. The system as recited in claim 4, wherein the gripper apparatus comprises a pair of opposed fingers coupled to at least one actuator.

6. The system as recited in claim 5, wherein the at least one actuator comprises a pneumatic actuator.

7. The system as recited in claim 4, wherein the holder comprises a handle portion at one end and a specimen-containing probe portion at an opposite end, and wherein the gripper apparatus is adapted to grip the handle portion.

8. The system as recited in claim 4, wherein the end effector further comprises a force sensor operably connected to the control means and configured to provide a signal indicative of a force present in the end effector to the control means, and wherein the control means is configured to control the robotic arm dependent upon the signal.

9. The system as recited in claim 8, wherein the end effector further comprises a compliance device operably connected between the gripper apparatus and the force sensor and configured to reduce a magnitude of a force resulting from a relatively small misalignment occurring when the robotic arm inserts the holder into the microscope.

10. A system for inserting a holder containing a specimen-bearing grid into a microscope, the system comprising:

a robotic arm;

an end effector attached to an end of the robotic arm and comprising:

a first gripper apparatus adapted to grip the grid;

a second gripper apparatus adapted to grip the holder;

a control means operably connected to the robotic arm and to the gripper apparatus and configured to control the robotic arm and the first and second gripper apparatus such that:

the first gripper apparatus grips the grid at a first location;

the robotic arm conveys the gripped grid from the first location to a second location;

the first gripper apparatus releases the grid at the second location such that the grid is positioned in the holder;

the second gripper apparatus grips the holder at the second location; and

the robotic arm inserts the gripped holder into the microscope.

11. The system as recited in claim 10, wherein the first and second gripper apparatus each comprise a pair of opposed fingers coupled to at least one actuator.

12. The system as recited in claim 10, wherein the holder comprises a handle portion at one end and a specimen-containing probe portion at an opposite end, and wherein the second gripper apparatus is adapted to grip the handle portion.

13. The system as recited in claim 10, wherein the end effector further comprises a force sensor operably connected to the control means and configured to provide a signal indicative of a force present in the end effector to the control means, and wherein the control means is configured to control the robotic arm dependent upon the signal.

14. The system as recited in claim 13, wherein the end effector further comprises a compliance device operably connected between the gripper apparatus and the force sensor and configured to reduce a magnitude of a force resulting from a relatively small misalignment occurring when the robotic arm inserts the holder into the microscope.

15. The system as recited in claim 10 wherein the control means includes a PC and a local TEM PC operable connected by a network.

16. The system as recited in claim 10 further including a vision analysis means for focusing in on a point of interest on the specimen-bearing grid.

17. A tray for storing a plurality of specimen grids, comprising:

a base comprising a substantially flat upper surface having a plurality of pockets formed therein, wherein each of the pockets comprises:

a central cavity adapted to receive one of the specimen grids; and

a pair of slots extending from opposite sides of the central cavity, wherein each of the slots is adapted to receive a finger of a gripper apparatus.

18. The tray as recited in claim 17, wherein the pockets are arranged to form a two dimensional array having a plurality of rows and a plurality of columns.

19. The tray as recited in claim 18, further comprising a plurality of grooves, wherein each of the grooves corresponds to a different one of the rows of the two dimensional array and passes through the pockets in the corresponding row.

20. The tray as recited in claim 17, further comprising a pair of holes each adapted to receive a positioning pin.

21. A probe station for loading a specimen-bearing grid into a holder, wherein the holder comprises a clamping arm for containing the grid within the holder, the probe station comprising:

a pair of "U"-shaped cradles for supporting the holder;

a vertical locking member, comprising:

a clamping portion;

a first actuator configured to raise the clamping arm of the holder; and

a second actuator configured to lower the clamping arm.

22. The probe station as recited in claim 21, wherein the vertical locking member is actuated between a raised position and a lowered position, and wherein in the lowered position the clamping portion applies a downward force to a holder positioned in the cradles, thereby holding the holder in the cradles.

23. The probe station as recited in claim 21, further comprising a first rod coupled to the first actuator for contacting the clamping arm of the holder, and a second rod coupled to the second actuator for contacting the clamping arm.